Laboratory Techniques for Capturing the Rapid Creation and Collapse of Dry Spot Regions

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**Experiment Setup**

The classical dam-break problem for the shallow water system with a dry/vacuum downstream state is created via popping a balloon non-intrusively.

\[ u_0(r) = 0 \]
\[ \theta = 0 \]
\[ t = 0 \]

**Motivation**

Assuming a potential energy preserving paraboloid shape of the balloon:

\[ t_c = \frac{1}{\sqrt{2g}} \approx 0.07s \]  \hspace{1cm} (1)

Using a Edgertronic high speed video camera (\( \mathcal{O}(1000) \)fps) to capture the interface and collapse time. Using LaVision PIV system (\( \mathcal{O}(10) \)fps) to capture the velocity field at a few instances in time.

(1) R. Camassa et al. Singularity formation as a wetting mechanism in a dispersionless water wave model. 2019 Nonlinearity 32 4049

**Results and Conclusion**

Model does an increasingly better job as potential energy plays a larger role and surface tension plays a smaller role.

Model interface has sharp features and different concavity than seen in the experiments.

**Ongoing Research**

Using particle image velocimetry (PIV) to create a velocity field of the flow.

- The fluid is ‘seeded’ with tiny spherical glass particles which reflect light
- A laser sheet is used to track the movement of particles to reconstruct the velocity field